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PSYCHOLOGICAL DISTANCE TO REWARD: SEGMENTATION OF APERIODIC SCHEDULES OF REINFORCEMENT

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College students responded for monetary rewards in two experiments on choice between differentially segmented aperiodic schedules of reinforcement. On a microcomputer, the concurrent chains were simulated as an air-defense video game in which subjects used two radars for detecting and destroying enemy aircraft. To earn more cash-exchangeable points, subjects had to shoot down as many planes as possible within a given period of time. For both experiments, access to one of two radar systems (terminal link) was controlled by a pair of independent concurrent variable-interval 60-s schedules (initial link) with a 4-s changeover delay always in effect. In Experiment 1, the appearance of an enemy aircraft in the terminal link was determined by a variable-interval (15 s or 60 s) schedule or a two-component chained variable-interval schedule of equal duration. Experiment 2 was similar to Experiment 1 except for the segmented schedule, which had three components. Subjects preferred the unsegmented schedule over its segmented counterpart in the conditions with variable-interval 60 s, and preference tended to be more pronounced with more components in the segmented schedule. These findings are compatible with those from previous studies of periodic and aperiodic schedules with pigeons or humans as subjects.

Key words: choice, psychological distance, interreinforcement interval, aperiodic schedules, concurrent chains, computer game, humans

According to a "psychological distance to reward" notion (Fantino, 1969), segmenting a schedule of reinforcement would have adverse effects on choice compared with an unsegmented schedule of equal duration. A good example of the segmented schedule is a chained (chain) schedule which has more than one component, each correlated with different stimulus and response requirements. Duncan and Fantino (1972) first demonstrated the segmentation effect using the concurrent-chains procedure (Autor, 1969). Their results showed that a fixed-interval (FI) schedule was preferred to a chained FI FI schedule of the same interreinforcement interval (IRI). Duncan and Fantino's (1972) findings were confirmed in a number of studies (Fantino, 1983; Leung, 1987; Leung & Winton, 1985, 1986, 1988) using pigeons as subjects.

More recently, Leung (1989) reported results from a similar choice procedure with college students. In this particular study, the concurrent chains were presented on a microcomputer in the form of an air-defense game in which two radars were available for detecting and destroying enemy aircraft. Subjects preferred the unsegmented schedule to its segmented two-component chain when the IRI was 20 s or longer (40 s and 60 s). When subjects were asked to estimate the length of the terminal-link schedules, the IRI with the segmented schedule was overestimated.

In comparing data from pigeons and humans, Leung (1989) observed at least two differences. First, the degree of preference shift observed for humans was less extreme than for pigeons even when the same IRI value was employed. Second, unlike pigeons, humans did not exhibit any significant increase in preference for the unsegmented schedule when the IRI was varied from 20 s to 60 s.

With few exceptions, past studies of segmentation have examined choice between periodic schedules (e.g., FI). When choice was between aperiodic schedules (Leung & Winton, 1985; Schneider, 1972), the occurrence of segmentation effects depended on whether a changeover delay (COD) was operative during the initial link. Weak preference for the unsegmented variable-interval (VI) schedule was found with a COD (Leung & Winton, 1985), and indifference was found when no COD was used (Schneider, 1972). The present study attempted to replicate and extend Leung and Winton's (1985) findings on the segmentation of aperiodic IRIs with human subjects. Two experiments were designed to compare preference between VI schedules and their chained counterparts. The video game version of the concurrent-chains procedure used by Leung

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(1989) was adopted. To explore the relationship between the number of components in the chain and the segmentation effect, chained schedules in the first experiment had two components, whereas those in the second experiment had three components. If the number of segments has an additional effect on choice, then preference for the unsegmented schedule in the three-component chained conditions should be greater than that in the two-component chained conditions.

EXPERIMENT 1

Experiment 1 compared choice between an unsegmented VI and a two-component chained VI of equal overall duration. The terminal-link IRI was 60 s or 15 s long in different conditions. The concurrent-chains procedure was implemented using a microcomputer in the form of an air-defense game.

METHOD

Subjects

Thirteen undergraduate college students (6 males and 7 females, mean age 18.5 years) were recruited from an introductory psychology course. As part of the course requirement, students had to participate in one psychological experiment.

Apparatus

The video game used by Leung (1989) was adopted and was presented on an IBM® (640K) AT-compatible microcomputer with a color monitor. A special two-key response panel was constructed and connected to the game port of the computer. Both response keys were black and were 10 cm apart. A key press that closed a microswitch produced a click. The software that controlled experimental events, data collection, and data analysis was written in BASIC.

Procedure

Figure 1 shows the air-defense video game in diagrammatic form. It followed the concurrent-chains procedure. The two radar systems represented the choice alternatives. During the initial link, the two radars appeared as two flashing circles (signifying that radars were still being charged), one on the left side and the other on the right side of the screen. Entry into the terminal link was arranged by two independent but identical VI 60-s schedules. A COD of 4 s was effective during this link (Herrnstein, 1961). In order to check whether charging was completed, the subject had to press one of the keys on the response panel. A key press occasionally allowed the subject access to an operational radar (terminal link) whereby that radar stopped flashing and a grid coordinate appeared on the radar screen, and the other radar became dark and inoperative. The delivery of reinforcement was determined by either a VI $2x$ s or a chain VI x s VI x s schedule. A response that fulfilled schedule requirements could produce a plane on the radar screen signaling the successful detection of an enemy aircraft. The plane had to be destroyed by pressing the key one more time within 2 s (i.e., limited hold) before it disappeared again. In the case of the chained terminal-link schedule, the first component was signified by a smaller grid flashing at the center of the radar screen; a change into a full-sized grid indicated the onset of the second component. The initial link was reinstated upon destroying an enemy plane or at the end of the limited hold. A successful hit was accompanied by an explosion video and sound effect. Each hit was rewarded by adding 50 points to a score counter centered at the bottom of the monitor but not overlapping with the two radars. A point was worth 1 cent and could be cashed in at the end of a session. The average earnings for a subject per session was about HK$25.

Two conditions, each corresponding to a different IRI duration, were included in the present experiment. In one condition, subjects were presented with a choice of VI 15 s versus chain VI 7.5 s VI 7.5 s, whereas in the other condition, subjects were presented with VI 60 s versus chain VI 30 s VI 30 s. To prevent key-position bias, a condition was repeated with the positions of the unsegmented key and the chained key reversed.

Training was conducted individually in a well-ventilated room. The subject was seated in front of the computer screen and was asked to hold the response box with both hands and to press the left key with the left thumb and the right key with the right thumb. In the first session, subjects were told about the objective of the video game and that the points obtained were exchangeable for money. To maximize

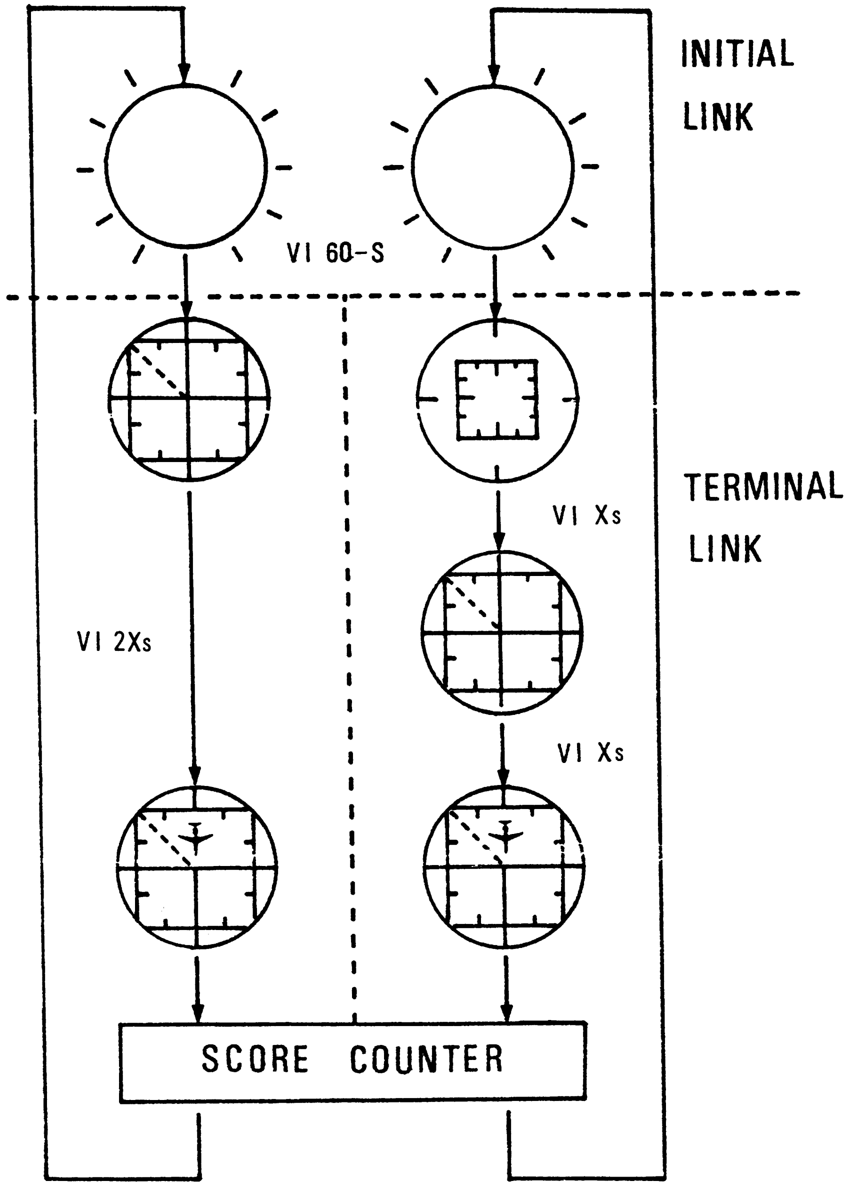

Fig. 1. A schematic diagram of the concurrent chains simulated on the microcomputer as an air-defense video game. The chained schedule in the terminal link of Experiment 1 had two components, whereas that of Experiment 2 had three components.

their earnings, subjects had to be quick in detecting and destroying enemy aircraft because they were given only a limited amount of time to earn points. The rest of the instructions were presented on the computer monitor at the beginning of a session:

> You are the air-defence officer and your responsibility is to detect any intruding aircraft and to destroy it upon discovery. You have two radars at your command. These radars require charging up after every use. Charging is indicated by the flashing of the radar screens. To check whether a radar is ready or not, you should press the keys on the response box, *one at a time,* the left key for the left radar and the right key for the right radar. Always use the left thumb for the left key and the right thumb for the right key. You should *never* depress the two keys together since this will overload the

power supply of the radar system and cause a blackout. When a radar is charged up and operative, a key press will turn off the other radar while the active radar will stop flashing and a grid coordinate will appear on the radar screen. Once the radar is operative, you can press the key to search for aircraft. Every key press will light up the radar screen briefly. Once an invading plane is detected and locked on by the radar, you must fire a missile (by pressing the key one more time) quickly before it disappears from the screen. For every enemy plane destroyed, you get 50 points added to your counter. Do you have any questions? Press either key to begin.

At the beginning of the first session, subjects were given 10 min to get familiar with the game. During the practice period, both terminal-link schedules were VI 15 s. A daily session was about 1 hr 15 min long, during which the two conditions alternated and each condition was presented twice (with different key positions). In effect, a session always consisted of four subsessions with a 1-min break between two consecutive conditions. A session could commence with either a 15-s terminal-link condition or a 60-s terminal-link condition with equal probability. For daily training, the initial key positions were randomly assigned to the unsegmented and the segmented schedules, although they were always reversed when the same condition was repeated. The intervals for all VIs were generated from progressions that scheduled events after varying times but with a constant probability (Fleshler & Hoffman, 1962). A subsession with the short IRI (15 s) lasted for 10 min, and that with the long IRI (60 s) lasted for 25 min. The order of conditions during a training session always differed from those of previous days. Subjects cashed in their points at the end of a daily session. Nine sessions were conducted for each subject. At the completion of the last session, subjects were interviewed on their strategies adopted and their understanding of the underlying schedules.

Results and Discussion

Except for the first one or two sessions, subjects always collected the reinforcer (i.e., shot down the plane as it appeared) within the limited hold. Hence, the reinforcement rate of the terminal-link schedule was calculated simply by dividing the total number of reinforcers by the total amount of time spent in that schedule.

For all conditions, the choice and reinforcement proportions were derived with respect to the unsegmented schedule. Subsequent analyses are based on data collected from the last two sessions of training and averaged (see Appendix). The choice proportion was obtained by dividing the number of responses on the unsegmented-schedule key by the total responses on both keys during the initial link. The reinforcement proportion is the ratio of the reinforcement rate obtained from the unsegmented key to the combined reinforcement rate obtained from both keys during the terminal link. Hence, a choice proportion greater than its corresponding reinforcement proportion indicates preference for the unsegmented schedule, and vice versa. In the terminal link, the response pattern was very steady for each subject, and the higher response rate was associated with the shorter IRI. Because these rates showed no systematic relationship with preference, they are not reported here.

Table 1 shows, for each subject, the choice and reinforcement proportions on the left and right keys. The group means and standard deviations are also presented. Although the reinforcement proportions varied across subjects, the deviations from .50 (both positive and negative) were generally small. The few exceptionally large values were caused by delayed response to scheduled events including component transitions and reinforcement. However, when pauses occurred, they were not confined to the segmented schedule. This is evident from the values of the reinforcement proportions above or below .50.

At the individual level, preference data for the short IRI condition differed from those for the long IRI condition. For the shorter IRI, choice and reinforcement proportions did not deviate systematically from .50. For the long IRI, 9 of the 13 subjects preferred the unsegmented VI to the chain VI VI, because their choice proportions were greater than the corresponding reinforcement proportions, although only 6 did so consistently (Table 1).

Analyses of group data further confirmed these observations of the difference between the two conditions. To eliminate key or position bias, results from the left- and right-key conditions of each terminal-link duration were first pooled before statistical analyses were

Table 1

In Experiment 1, the individual choice proportion and reinforcement proportion for the unsegmented VI schedule over a two-component chain of equal duration. The terminal-link durations were either 15 s or 60 s. The group means and standard deviations are also shown.

	Terminal-link schedules							
	Chain VI 7.5 s VI 7.5 s versus VI 15 s				Chain VI 30 s VI 30 s versus VI 60 s			
	Unsegmented left key		Unsegmented right key		Unsegmented left key		Unsegmented right key	
Subject	Choice proportion	Rft proportion	Choice proportion	Rft proportion	Choice proportion	Rft proportion	Choice proportion	Rft proportion
S1	.58	.55	.54	.51	.75	.56	.55	.50
S2	.45	.48	.45	.50	.58	.62	.60	.63
S3	.48	.44	.54	.51	.45	.57	.61	.53
S4	.48	.49	.63	.57	.48	.63	.63	.55
S5	.65	.55	.40	.45	.65	.57	.52	.45
S6	.53	.50	.50	.54	.48	.51	.79	.57
S7	.41	.54	.50	.55	.62	.50	.85	.55
S8	.52	.49	.40	.46	.45	.52	.41	.40
S9	.40	.50	.43	.53	.48	.49	.65	.54
S10	.45	.48	.61	.55	.70	.56	.72	.55
S11	.47	.45	.48	.52	.46	.52	.52	.49
S12	.57	.52	.50	.48	.54	.55	.61	.50
S13	.55	.52	.47	.50	.60	.53	.55	.49
M	.50	.50	.50	.51	.56	.53	.62	.52
SD	.07	.03	.07	.04	.10	.05	.12	.06

conducted (Table 1). For the 15-s IRI condition, the averaged choice and reinforcement proportions did not differ. The group mean choice and reinforcement proportions for the 60-s IRI conditions were .59 and .53, respectively. Statistically, with respect to the reinforcement proportion, the greater choice proportion indicated a significant preference, $t(12) = 3.01, p < .02$, for the unsegmented aperiodic schedule over its two-component chained counterpart for this IRI.

Thus, the present results replicated those previously found with pigeons (Leung & Winton, 1985), who also preferred the unsegmented aperiodic schedule over the segmented one. In addition, our previous study (Leung, 1989) and the present one showed that humans were less vulnerable to the aversive effect of segmentation when the IRI was short. For example, in the present Experiment 1, Chinese students did not prefer the unsegmented aperiodic schedule over the chain when the terminal-link duration was 15 s. Because similar data on aperiodic schedules are not yet available for pigeons, it cannot be determined whether the indifference observed in our studies was due to the specific schedule parameters or due to the idiosyncratic responding of humans. Nevertheless, these results suggest that segmentation increases the "psychological distance to reward" for both periodic and aperiodic IRIs.

EXPERIMENT 2

The notion of psychological distance (Fantino, 1969) implies that dividing an IRI into two or more discriminable segments lengthens perceived time to reward. Thus far research has examined this effect largely with IRIs bisected into two equal segments. Whether the number of segments has any influence on choice remains largely an unexplored issue. The most relevant information is provided by the pioneer work of Duncan and Fantino (1972), who compared two-component chains with three-component chains of equal IRI. In their second experiment, pigeons were presented with a choice between a chain FI x s FI x s schedule and a chain FI y s FI y s FI y s schedule, where $2x = 3y$. It was found that in eight of the nine cases, pigeons preferred the chain with fewer components to the chain with more components. These results showed that a less segmented schedule is chosen more often than its segmented counterpart.

The present experiment represents another attempt to explore the effect of the number of segments on choice by comparing an unsegmented schedule to a three-component chain of variable IRI. Human subjects were presented with a VI $3y$ s schedule and a chain VI y s VI y s VI y s schedule in the terminal link of the concurrent chains. The choice procedure was again presented on a microcomputer in the form of an air-defense video game. The present experiment used the same IRI values (15 s or 60 s) as in Experiment 1.

METHOD

Subjects and Apparatus

The same group of subjects agreed to participate in an additional experiment; this time, they participated mainly on a voluntary basis. The apparatus used was the same as in Experiment 1.

Procedure

The procedure was the same as in Experiment 1 except for one aspect. The terminal-link chained schedule had three instead of two components. Again, the terminal-link duration was either 15 s or 60 s. In two conditions, comparisons were made between VI 15 s and chain VI 5 s VI 5 s VI 5 s, and between VI 60 s and chain VI 20 s VI 20 s VI 20 s. Precautions were taken to avoid key-position bias and order effects. Subjects also earned points that were convertible to cash payment at not less than HK$25 per training session.

RESULTS AND DISCUSSION

Table 2 presents individual choice and reinforcement proportions with regard to the unsegmented schedule on the left and right keys. The group means and standard deviations of these measures for both 15-s IRI conditions and 60-s IRI conditions are also shown. Data were averaged over the last two sessions of training. Responding during the terminal link had been steady, and the response rates were comparable to those observed in Experiment 1 (see Appendix).

For the 15-s IRI, subjects showed no consistent preference for the unsegmented schedule. Only 8 of the 13 subjects had choice proportions exceeding the reinforcement proportions. When group means (pooled for the two key positions as shown in the Appendix) were considered, the choice proportion did not differ significantly from the reinforcement proportion, thus showing no segmentation effect.

For the longer IRI (60 s), the majority of the subjects preferred the unsegmented VI schedule. Choice proportions from 12 of the 13 subjects exceeded .50, and they were also larger than the corresponding reinforcement proportions, $t(12) = 5.6$, $p < .001$. Although reinforcers obtained from the two terminal-link schedules were not evenly distributed, subjects clearly favored the VI schedule over its tri-segmented counterpart. The only exception was S5, who appeared to have a reverse preference as indicated by his pooled choice (.49) and reinforcement (.55) proportions. This subject exhibited a consistent bias against the unsegmented schedule during this experiment.

These results are similar to those obtained in Experiment 1 in that the segmentation effect was observed in the 60-s IRI condition but not in the 15-s IRI condition. However, there is one major difference. For the longer IRI, the preference shift for the unsegmented schedule was greater in the tri-segmented condition (mean choice proportion = .64) than in the bi-segmented condition (mean choice proportion = .59). This difference was apparent for 10 of 13 subjects. The discrepancy appears to indicate an effect on preference due to the the number of components in the chained schedule. Unfortunately, a definitive interpretation of this comparison is prohibited for two reasons. First, preference cannot be meaningfully compared between the two cross-experiment 60-s IRI conditions because their reinforcement proportions were unequal. At present, there exists no acceptable procedure for taking into account differences in reinforcement proportions.

Second, the data could be confounded by an order effect. The within-subject design (i.e., all subjects were exposed to both Experiments 1 and 2 in that order) was adopted to reduce intersubject variability, but the training effect in Experiment 1 could have influenced performance in Experiment 2. From a closer inspection of the data, an order effect is not evident, because individual choice performances across experiments were often dissimilar, and preference was sensitive to the change in ex-

Table 2

In Experiment 2, the individual choice proportion and reinforcement proportion for the unsegmented VI schedule over a three-component chain of equal duration. The terminal-link durations were either 15 s or 60 s. The group means and standard deviations are also shown.

	Terminal-link schedules							
	Chain VI 5 s VI 5 s VI 5 s versus VI 15 s				Chain VI 20 s VI 20 s VI 20 s versus VI 60 s			
	Unsegmented left key		Unsegmented right key		Unsegmented left key		Unsegmented right key	
Subject	Choice proportion	Rft proportion	Choice proportion	Rft proportion	Choice proportion	Rft proportion	Choice proportion	Rft proportion
S1	.54	.40	.62	.45	.73	.55	.61	.54
S2	.56	.56	.60	.55	.80	.52	.43	.47
S3	.52	.55	.51	.51	.62	.54	.72	.51
S4	.52	.53	.54	.48	.57	.58	.60	.55
S5	.48	.51	.47	.53	.49	.55	.49	.54
S6	.74	.66	.60	.62	.75	.57	.60	.53
S7	.50	.54	.52	.52	.59	.53	.69	.50
S8	.45	.54	.59	.53	.55	.51	.64	.54
S9	.70	.55	.40	.52	.78	.54	.54	.58
S10	.65	.54	.49	.53	.65	.60	.56	.52
S11	.48	.52	.55	.55	.72	.53	.63	.60
S12	.50	.49	.60	.53	.83	.60	.67	.55
S13	.53	.42	.72	.56	.57	.47	.80	.61
M	.55	.52	.55	.53	.67	.55	.61	.54
SD	.09	.06	.08	.04	.11	.04	.10	.04

perimental condition. However, to avoid this source of confounding, future research could either use different groups of subjects or control for the order of training in each subject.

Notwithstanding the above limitations, the present data provide evidence for the potency of the number of components in the segmented schedule as another factor affecting choice between segmented and unsegmented schedules, at least with a sufficiently large IRI.

GENERAL DISCUSSION

The present experiments further explored choice between segmented aperiodic VI schedules of reinforcement using human subjects. Results were generally consistent with those previously obtained from both nonhumans (Duncan & Fantino, 1972; Leung & Winton, 1985) and humans (Leung, 1989). Furthermore, factors found to affect choice in previous studies were also relevant here. One good case in point is the positive relationship between the IRI size and preference for the less segmented schedule. In the present study, subjects were more likely to choose the VI schedule in the 60-s IRI conditions than in the 15-s IRI conditions. Hence, segmentation extends the "psychological distance to reward" in humans both for periodic and aperiodic IRIs.

In the present study, differentially segmented VI chained schedules were used in two experiments to assess the effect of segment number on choice. The number of components in the segmented schedule appeared to influence choice. Our subjects showed greater preference for the unsegmented schedule when number of components in the chain was three instead of two. This finding, if substantiated, is in agreement with the results reported by Duncan and Fantino (1972) for pigeons. In their Experiment 2, preference was found for a two-component chain over its three-component counterpart of equal overall duration. However, our results are not directly comparable with those obtained by Duncan and Fantino (1972) because we did not conduct a chain/chain comparison. Due to the dearth of results available, further parametric research is needed to establish the robustness of segment number as another factor affecting choice.

If segmentation per se is responsible for the preference observed in periodic IRIs, then segmenting an aperiodic IRI should have similar effects. However, aperiodic schedules appeared less sensitive to the segmentation effect (Leung & Winton, 1985; Schneider, 1972). Leung and Winton (1985) compared segmented and unsegmented VI schedules and were able to obtain only a weak preference shift when a COD was used in the initial link of the concurrent chains. How can we explain the discrepancy between periodic and aperiodic IRIs? Obviously, periodic and aperiodic schedules differ in the temporal control they exert on the pattern of responding (Ferster & Skinner, 1957) and choice behavior (e.g., Herrnstein, 1964; Killeen, 1970). It has been pointed out that the functional length of a VI schedule, as compared to its nominal value, may well be somewhat reduced (Herrnstein, 1964). According to Duncan and Fantino's (1970) study, the smallest interval in a terminal-link schedule is a crucial determinant of preference for that schedule. Thus, with some very short intervals, a VI schedule may be considered functionally equivalent to an FI of smaller IRI. Because segmenting a small periodic IRI has less dramatic effect on choice (Duncan & Fantino, 1972; Leung & Winton, 1985, 1986, 1988), less preference shift is expected when segmenting an aperiodic IRI of the same nominal value.

Although the present findings are consistent with those for periodic schedules, one could argue that the segmentation effect in aperiodic schedules may well be a procedural artifact. This is because even when a VI schedule and its chained counterpart have the same overall duration, their actual intervals can be dissimilar, because an interval in a chain is the sum of the intervals from each of the smaller component VI schedules. Consequently, the harmonic mean value of the resultant chained VI intervals will not be the same as that of the unsegmented VI intervals. Given that one of the controlling variables influencing choice maintained by VI schedules is the harmonic mean of the intervals (Killeen, 1968), the observed preference for the unsegmented schedule could be due to the unequal distribution of the intervals in the two schedules.

However, the harmonic-mean analysis of the reinforcement value associated with a segmented aperiodic schedule may not be fruitful because the location of an interval within the chain is also important. Leung and Winton (1986) showed that having a short interval in the first component and a long interval in the second produced an extreme preference shift, whereas reversing the location of these intervals produced only a minimal effect. A particular interval can affect choice differently depending on whether it is at the first component or at the second one. Future segmentation studies with aperiodic interval schedules should therefore attempt to control for these variables. For example, the segmented schedule should consist of the same set of intervals but have each of the intervals divided up into components of equal length. Obviously, research on the role of these factors will further contribute to our knowledge on the segmentation processes.

In summary, the present results have replicated previous findings concerning segmentation of interval schedules of reinforcement. The detrimental effect on choice was observed in segmenting both periodic and aperiodic IRIs, and this phenomenon generalized across species (i.e., pigeons and humans). The present results further extended Duncan and Fantino's (1972) findings in that increasing the degree of segmentation of an IRI tended to lengthen the "psychological distance to reward."

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APPENDIX

In Experiments 1 and 2, for each subject, the response rate (responses per minute), the reinforcement rate (reinforcements per hour), the choice proportions, and the reinforcement proportion averaged over the left and right unsegmented keys for each IRI duration.

	Experiment 1											
	Chain VI 7.5 s VI 7.5 s/VI 15 s						Chain VI 30 s VI 30 s/VI 60 s					
	Chain key		VI 15 s key		Averaged		Chain key		VI 60 s key		Averaged	
Subject	Resp. rate	Rft rate	Resp. rate	Rft rate	Choice prop.	Rft prop.	Resp. rate	Rft rate	Resp. rate	Rft rate	Choice prop.	Rft prop.
S1	45	179	57	202	.56	.53	19	39	36	44	.65	.53
S2	68	234	56	225	.45	.49	15	36	22	40	.59	.53
S3	49	221	51	200	.51	.48	32	42	36	51	.53	.55
S4	42	166	52	187	.56	.53	26	26	32	38	.56	.59
S5	52	222	57	223	.53	.50	26	54	37	56	.59	.51
S6	39	222	41	240	.52	.52	19	37	33	44	.64	.54
S7	66	197	55	236	.46	.55	16	43	44	47	.74	.53
S8	41	210	35	190	.46	.48	33	53	25	45	.43	.46
S9	61	193	43	205	.42	.52	27	49	35	52	.57	.52
S10	50	187	56	199	.53	.52	17	42	41	53	.71	.56
S11	64	237	58	223	.48	.49	37	51	36	50	.49	.50
S12	47	219	54	220	.54	.50	27	45	37	50	.58	.53
S13	44	188	46	196	.51	.51	19	46	26	48	.58	.51

APPENDIX (*Continued*)

	Experiment 2											
	Chain VI 5 s VI 5 s VI 5 s/VI 15 s						Chain VI 20 s VI 20 s VI 20 s/VI 60 s					
	Chain key		VI 15 s key		Averaged		Chain key		VI 60 s key		Averaged	
Subject	Resp. rate	Rft rate	Resp. rate	Rft rate	Choice prop.	Rft prop.	Resp. rate	Rft rate	Resp. rate	Rft rate	Choice prop.	Rft prop.
S1	39	225	54	166	.58	.43	18	61	36	50	.67	.55
S2	27	156	37	195	.58	.56	19	53	31	52	.62	.50
S3	47	177	50	200	.52	.53	17	51	35	56	.67	.53
S4	49	202	55	206	.53	.51	26	44	36	57	.59	.57
S5	62	212	56	230	.48	.52	39	40	37	48	.49	.55
S6	26	119	53	211	.67	.64	17	45	36	55	.68	.55
S7	55	190	57	214	.51	.53	20	52	35	55	.64	.52
S8	29	159	31	183	.52	.54	22	38	32	42	.60	.53
S9	47	193	57	222	.55	.54	19	39	36	49	.66	.56
S10	43	190	57	218	.57	.54	24	44	38	56	.62	.56
S11	49	189	52	217	.52	.54	18	45	37	57	.68	.57
S12	43	197	53	205	.55	.51	12	43	35	58	.75	.58
S13	23	199	39	191	.63	.49	12	39	27	46	.69	.54